The Witch of Maria Agnesi

The "witch of Agnesi" is a curve studied by Maria Agnesi in 1748 in her book *Instituzioni analitiche ad uso della giovent italiana* (the first surviving mathematical work written by a woman). The curve is also known as cubique d'Agnesi or agnsienne, and had been studied earlier by Fermat and Guido Grandi in 1703.

The name "witch" derives from a mistranslation of the term *averisera* "versed sine curve" (from the Latin "vertere", to turn) in the original work as *avversiera* ("witch" or "wife of the devil") in an 1801 translation of the work by Cambridge Lucasian Professor of Mathematics John Colson (Gray). [1]

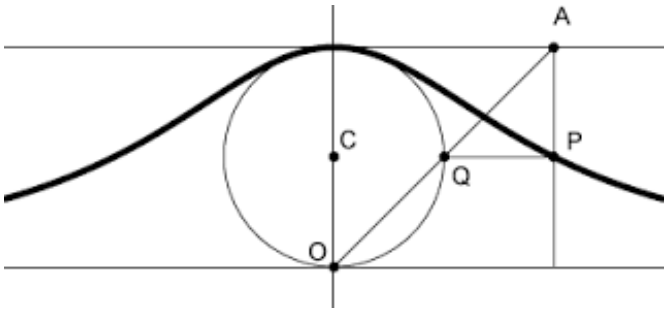

FIGURE 1.1. The Witch of Maria Agnesi(1748).

Refer to Figure 1.1. Starting with a fixed circle center C and radius a. A point O on the circle is chosen. For any other point Q on the circle, the secant line OQ is drawn. The point M (not shown) is diametrically opposite to O. The line OQ intersects the tangent of M at the point A. The line parallel to OM through A, and the line perpendicular to OM through Q intersect at P. As the point Q is varied, the path of P is the Witch of Agnesi.

Your goal is to find parametric equations for the Witch of Maria Agnesi.

[1] http://mathworld.wolfram.com/WitchofAgnesi.html